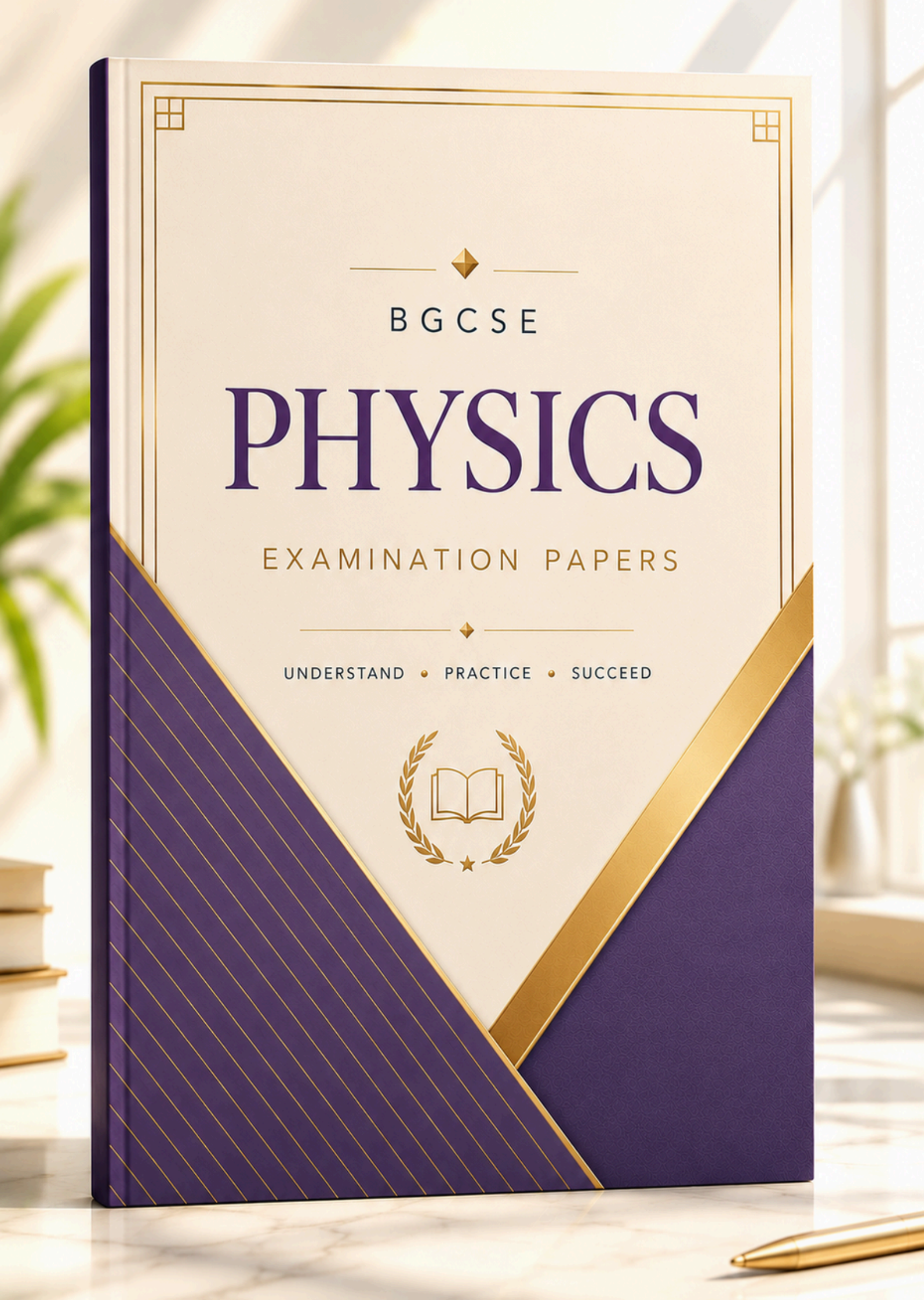
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PHYSICS

PAPER 2 3117/2

Friday 18 JUNE 2021 1:30 P.M.–3:00 P.M.

Additional materials:
None

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BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials in the spaces provided above.

Answer **ALL** questions in this paper in the spaces provided.

Calculators may be used on this paper.

Read each question carefully and make sure you know what you have been asked to do before starting your answer.

Show **ALL** your working when answering numerical questions. Lines are provided on the question paper for your answers. You should write your answers on these lines only.

The mark for each part-question is given in brackets [ ].

This question paper consists of 17 printed pages and 3 blank pages.

1. A warehouse owner has to stack 40 identical metal blocks, each of weight 1500 N on the floor in a storage room.

Fig. 1.1 shows a top view of the dimensions of the block.

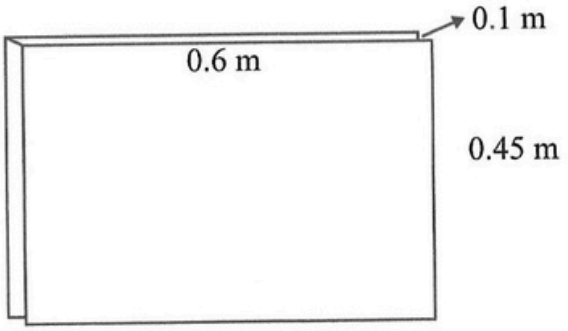

Fig. 1.1

Fig. 1.2 shows two possible options of stacking the metal blocks the warehouse owner is considering, in order to minimise pressure exerted on the floor. He seeks to determine the pressure exerted by the metal blocks when standing lying flat (case A) and standing on end (case B).

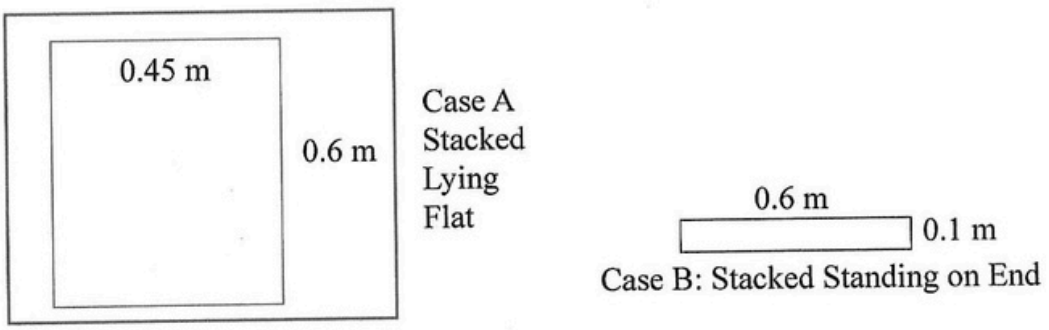

Fig. 1.2

(a) What is the volume of the metal block?

[2]

(b) (i) Calculate the area in contact with the shelf when the 40 metal blocks are stacked one on the other while lying flat **(Case A)**.

[2]

(ii) Calculate the pressure exerted on the shelves by the 40 metal blocks in **Case A**.

[3]

(c) The 40 metal blocks are allowed to stand on end as shown in **Case B**.

Without further calculation, predict the magnitude of the pressure exerted on the shelf by the 40 metal blocks in **Case B** in relation to that in **Case A**.

(i) _____

_____ [1]

(ii) Give a reason for your response to c (i).

_____

_____ [2]

TOTAL MARKS [10]

2. This question is about Gas Laws.

Fig. 2.1 shows the parts of a typical hot air balloon. Prior to its ascent, the balloon is filled with air and heated. The envelope is made of elastic material which stretches when the pressure inside the balloon is greater than the pressure outside.

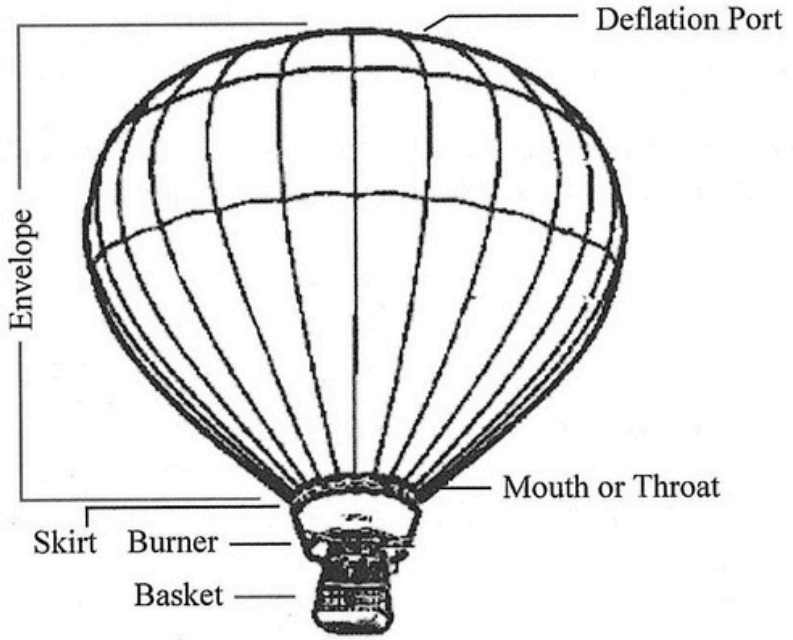

Fig. 2.1

(a) When the air is heated, what happens to the:

(i) kinetic energy of the gas particles?

_____ [1]

(ii) volume of gas contained in the balloon?

_____ [1]

(iii) density of gas within the balloon?

_____ [1]

(b) As altitude increases, atmospheric pressure decreases.

What effect, if any, would the decrease in atmospheric pressure have on the volume of gas in the balloon?

_____ [1]

(c) Fig. 2.2 shows a pressure – volume graph of a fixed mass of gas.

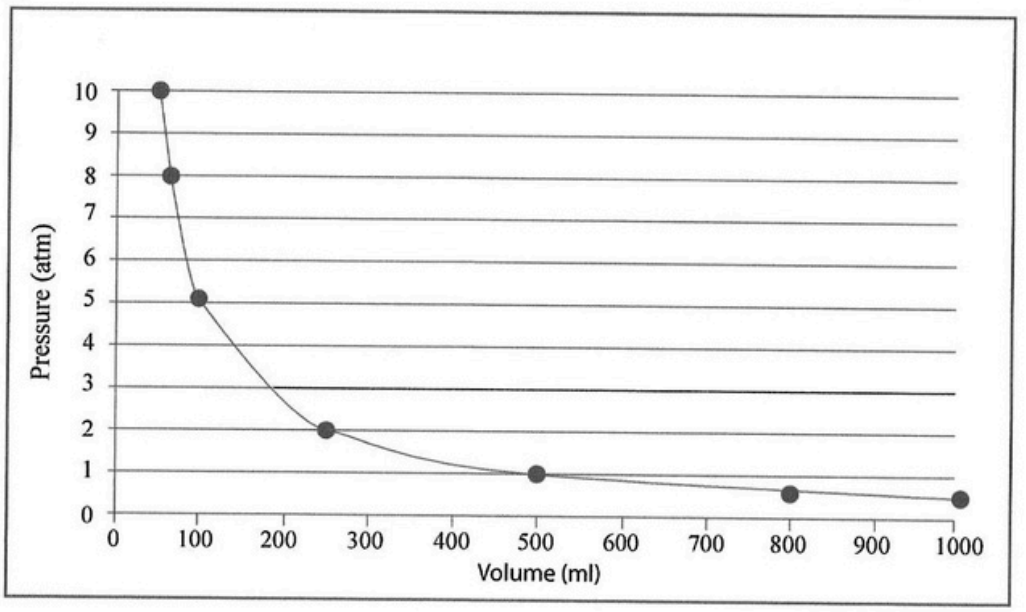

Fig. 2.2

(i) Under what conditions must the readings have been taken?

_____ [1]

(ii) What is the volume of the gas when the pressure is 5 atm?

_____ [1]

(iii) What is the pressure when the volume is 400 mL?

_____ [1]

(d) Describe the relationship between pressure and volume.

_____ [1]

(e) On Fig. 2.2, sketch the curve that would be obtained if the experiment was repeated at higher temperature. [1]

(f) A bubble of gas rises from 80 m deep in a body of water to the surface.

What happens to the volume of the bubble as it rises?

_____ [1]

TOTAL MARKS [10]

3. This question is about Newton's Laws of Motion, speed-time graphs and Momentum.

Given the speed-time Graph below answer the following questions.

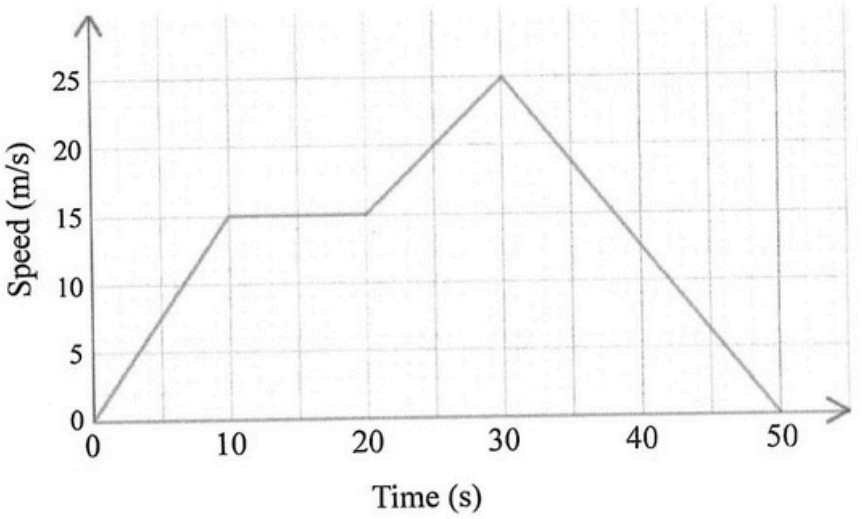

Fig. 3.1

(a) Calculate the acceleration of the object during the first 10 seconds.

[2]

(b) What physical quantity is represented by the area under the curve of the graph?

_____ [1]

(c) If the object has a mass of 100 kg, calculate the force on the object in the first 10 seconds.

[2]

(d) Calculate the momentum of the object between the times 10 s and 20 s.

[2]

(e) If the object hits another object and immediately comes to rest, what happens to the momentum of both objects?

_____ [1]

(f) Using the graph above calculate the total distance travelled by the object.

[2]

TOTAL MARKS [10]

4. This question is about magnetism.

(a) In the space below draw a bar magnet and label each pole, one being North facing and the other being South facing. Draw lines to represent the area of magnetic field.

[3]

(b) What do the arrows on the lines represent?

_____

_____ [1]

(c) Why are the field lines closer together near the poles of the magnet?

_____

_____ [1]

(d) List **two** ways in which a piece of steel bar can be magnetised.

_____

_____ [2]

(e) A piece of copper wire is moved vertically in a magnetic field between the north and south poles of a magnet. Draw a diagram to represent this and explain what happens in the wire.

[3]

TOTAL MARKS [10]

5. This question is about electromagnetic radiation.

(a) Explain how X-rays can be used to obtain an image of a broken bone.

_____

_____

_____

_____ [3]

(b) The wavelength range for visible light is approximately 400 nm to 700 nm.

Calculate the frequency range for visible light given that the speed of light is 3.0×10^8 m/s.

[3]

(c) X-rays are ionising radiation. Identify one other kind of ionising radiation found in the electromagnetic spectrum.

_____ [1]

(d) What type of electromagnetic radiation is used to rapidly heat food?

_____ [1]

(e) Name **two** characteristics that all electromagnetic waves have in common.

_____

_____

_____ [2]

TOTAL MARKS [10]

6. This question is about energy and work.

Fig. 6.1 shows a simplified diagram of a 65 kg diver on a diving board. The height gained by the diver at the peak of his dive is 10 m. (g = 10N/kg)

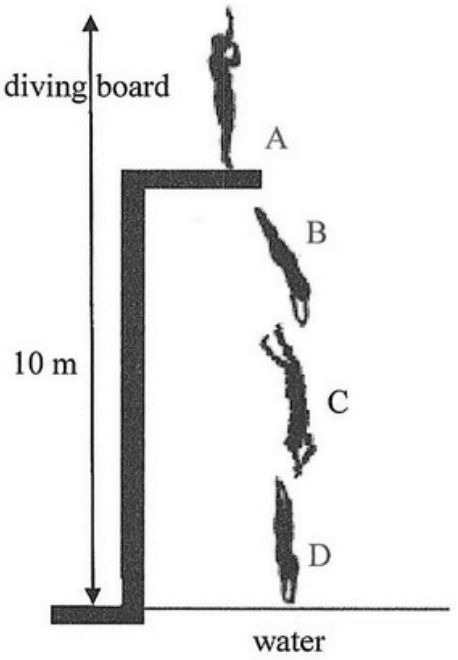

Fig. 6.1

(a) (i) Calculate the gravitational potential energy gained by the diver at the peak of his dive.

_____ [2]

(ii) Calculate the speed of the diver as he enters the water.

[3]

(b) Give the energy transformation that occurs as the diver descends into the water.

_____ [1]

(c) The vertical height of the stairs is 7.0 m. He takes 15 seconds to walk up the stairs.

(i) Calculate the work done in raising his body mass as he climbs the stairs.

[2]

(ii) Calculate the output power he develops when raising his body mass.

[2]

TOTAL MARKS [10]

7. This question is about light waves.

At an annual eye examination, a student was required to sit 2.5 m in front of a plane mirror and read off the letters on the eye chart card 3.5 m from the mirror as shown in Fig. 7.1.

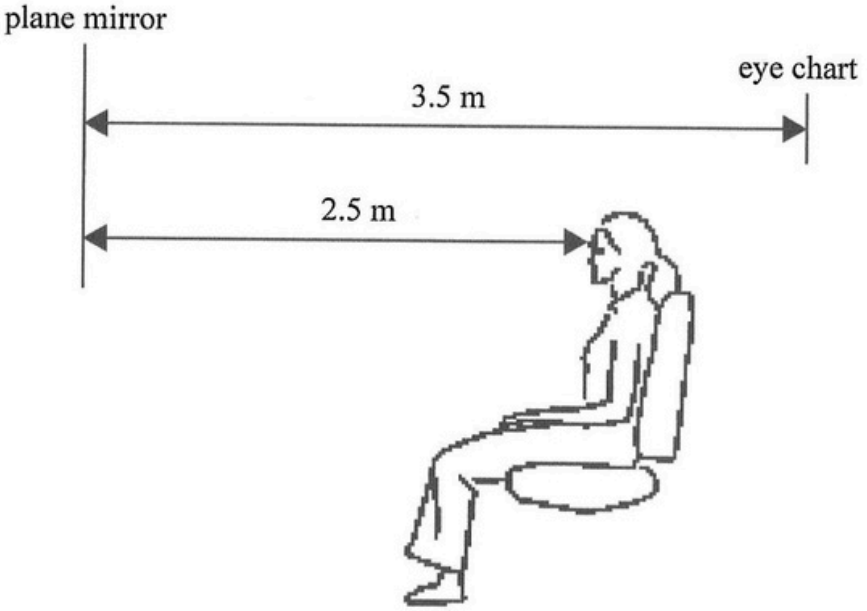

Fig. 7.1

(a) (i) How far is the student from her image in the mirror?

_____ [1]

(ii) At what distance from the student's eye does the image of the letters being viewed appear?

_____ [1]

(iii) While looking into the mirror, how does the size of the examination room, appear to the student, in relation to its actual size?

_____ [1]

(b) Upon returning home, the student wanted to investigate the properties of images in plane mirrors further.

The student cuts out the letter **O** and places it in front of a plane mirror as shown in Fig. 7.2.

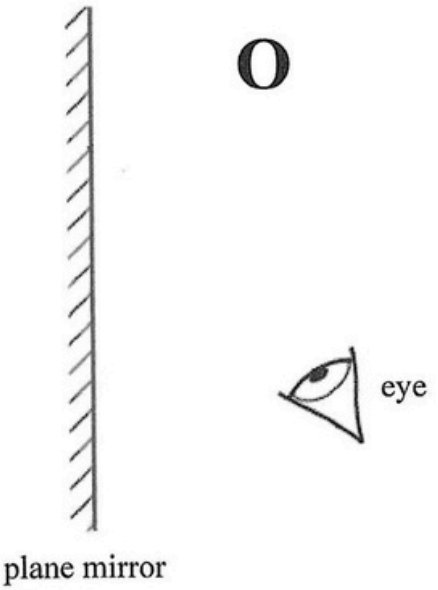

Fig. 7.2

(i) On Fig. 7.2, draw 2 rays that reflect from the letter **O**, onto the mirror then into the eye of the student shown.

Complete the ray diagram to show how the image of the letter **O** is formed in the plane mirror. [3]

(ii) How differently would the image appear if the student placed the letter **E**, of similar size, the same distance from the mirror as **O**?

_____

_____ [1]

(iii) Give the term used to describe the type of image formed in the plane mirror.

_____ [1]

(iv) The student then places the letter **O**, 6 cm in front of a concave mirror of focal length 4 cm.

State **two** properties of the image formed.

_____

_____ [2]

TOTAL MARKS [10]

8. This question is about electricity.

A student sets up simple circuits to investigate the basic properties of series and parallel circuits using a 6 V battery, a 3Ω lamp and resistor of 4Ω shown in Figs. 8.1 and 8.2.

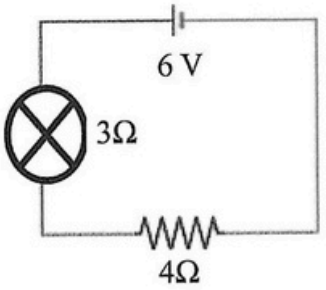

Fig. 8.1

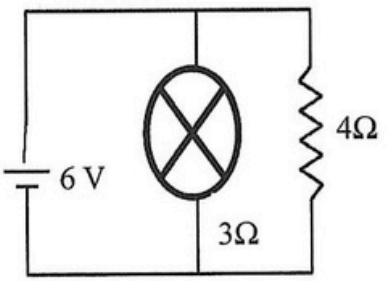

Fig. 8.2

(a) Using the circuit shown in Fig. 8.1, calculate the:

(i) current flowing through the battery

[2]

(ii) voltage across the lamp

[2]

(b) Using the circuit shown in Fig. 8.2, calculate the:

(i) total resistance

[2]

(ii) current flowing through the lamp

[2]

(c) Explain why a metal wire is an electrical conductor, but plastic is used as an electrical insulator.

_____

_____

_____

_____ [2]

TOTAL MARKS [10]

End]

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